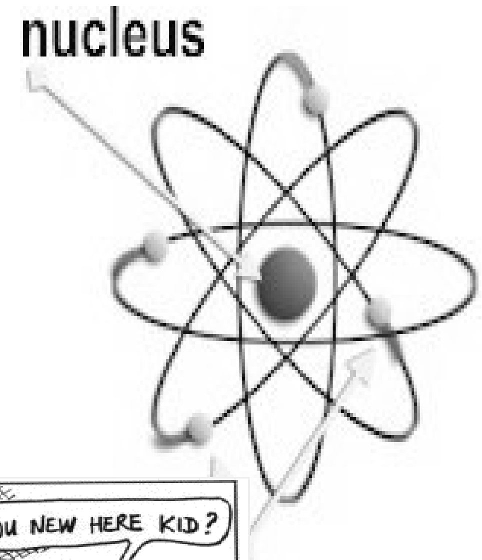
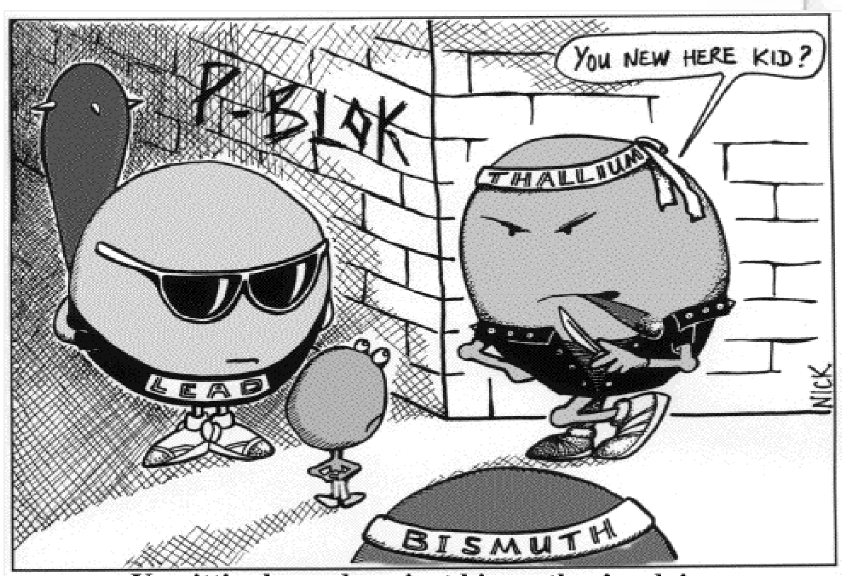
Name:________________________________

EMC Unit 3

The atom
& periodic table





Unwittingly, and against his mother's advice, Vince the first-row transition metal had been lured far away from home, and now found himself surrounded by heavier elements of the P-block.

Name:________________________________

Required Materials Check-Off
Supply Check

Remember: I will check you materials at least 3 times this semester, so bring everything to class EVERYDAY!

Calculator _____

Pencil _____

Three Ring Binders _____

Section Dividers _____

Spiral _____

Textbook _____

Name:______________________________

The Atoms Family

In the center of **Matterville**, there is a place called the **Nucleus Arcade**, where two members of the Atoms Family like to hang out. **Perky Patty Proton**, like her sisters, is quite large with a huge smile and eyes that sparkle (+). Patty is always happy and has a very *positive* personality. **Nerdy Nelda Neutron** is large like Patty, but she has a boring, flat mouth and eyes with zero expression (o). Her family is very apathetic and *neutral* about everything. Patty, Nelda, and their sisters spend all their time at the arcade.

Around the Nucleus Arcade, you will find a series of roadways that are used by another member of the Atoms Family, **Enraged Elliott Electron**. Elliott races madly around the Arcade on his bright red chrome-plated Harley-Davidson. He rides so fast that no one can be sure where he is at any time. Elliott is much smaller than Patty and Nelda and he is always angry because these bigger relatives will not let him in the Arcade. He has a frown on his face, eyes that are squinted with anger, and a very negative (-) attitude.

The first energy street can only hold only two Electron brothers. The second energy street, called the Energy Freeway, can hold 8 brothers. The third energy street, called the Energy Superhighway, can hold 18 of the brothers.

The morale of Matterville is stable as long as each negative Electron brother is balanced out by one positive Proton sister. The number of residents in Matterville depends on the Proton and Neutron families.

Challenge: What would happen to the morale of Matterville if one Elliott Electron was kidnapped?

Name:

Description:

Favorite Activity:

Name:

Description:

Favorite Activity:

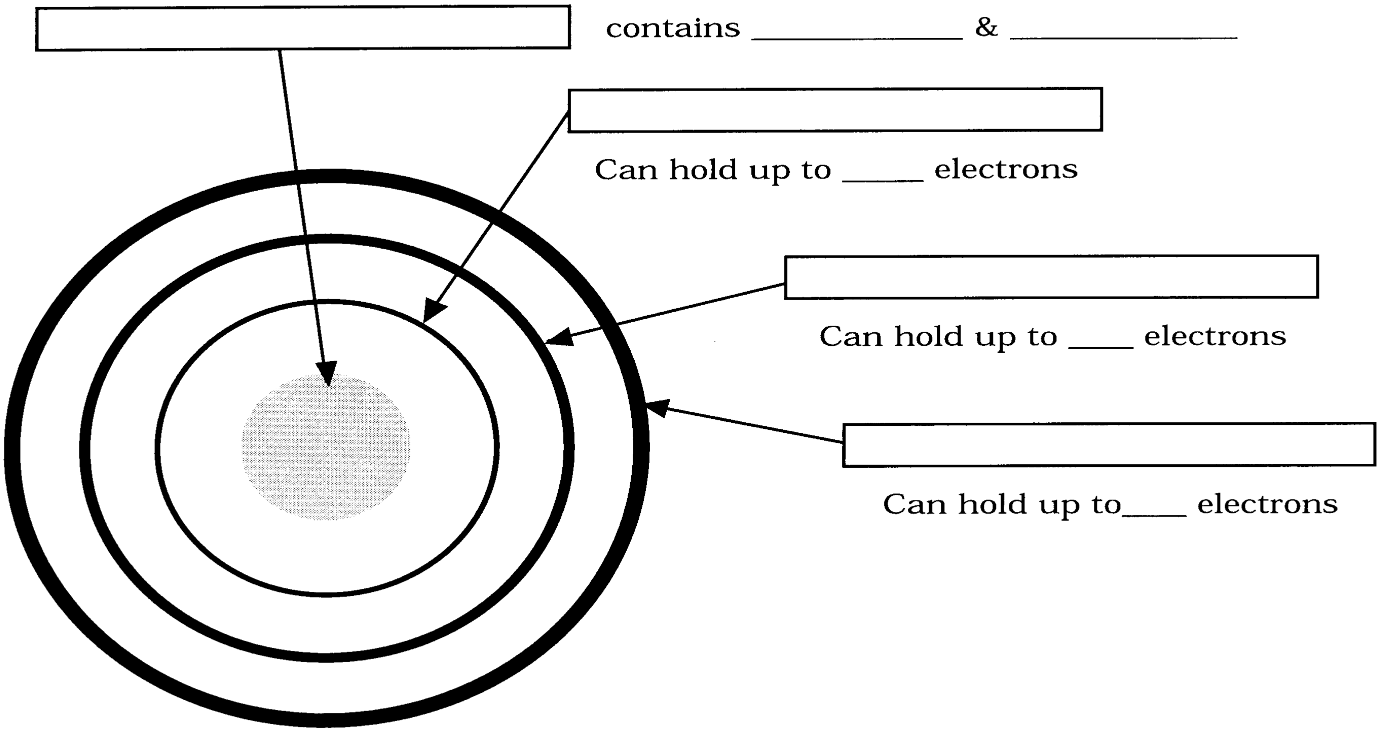
Name:

Description:

Favorite Activity:

Name:______________________________

MATTERVILLE



The Atoms Family Song

1st Verse:

They're tiny and they're teeny,
Much smaller than a beany,
They never can be seeny,
The Atoms Family.

Chorus

2nd Verse:

Together they make gases,
And liquids like molasses,
And all the solid masses,
The Atoms Family

Chorus

3rd Verse:

Neutrons can be found,
Where protons hang around;
Electrons they surround
The Atoms Family.

Chorus

Chorus:

They are so small.
(*Snap, snap)*
They're round like a ball.
(*Snap, snap)*
They make up the air.
They're everywhere.
Can't see them at all.
(Snap, snap)

Sing to the tune of the Adams Family Theme song

Name:________________________________

Reading Guide: Structure of the Atom
Chapter 17 Section 1
(Pages 506-511)

1. List 4 element names and their symbols below.

Element Name	Symbol

2. What are the rules for creating a symbol of an element?

3. What are the three pats of an atom and what are their charges?

Subatomic Particle	Charge

Name:________________________________

4. Describe the model of an atom that each scientist contributed and make a quick sketch of that model.

	Description	Sketch
Democritus		

	Description	Sketch
Thomson		

	Description	Sketch
Rutherford		

	Description	Sketch
Bohr		

Name:________________________________

5. What is the most current model of the atom? Why is it most accurate?

6. What important science is done in Batavia, Illinois?

Name:________________________________

Atomic Structure Internet Activity

Directions: go to the website http://www.colorado.edu/physics/2000/applets/a2.html

*a. Make sure that you are on **David's Whizzy Periodic Table**.*
*b. Once there, click on **Hydrogen (H)**.*
*c. Choose the **Nuclear View***

You will be completing the follow chart as you search this website.

Color Particle	Name	Charge
Red		
Black		
Yellow & Pink		

1. What does the red particle represent? Fill in the red particle row in the chart above.

2. What charge does the red particle have? _____________________________

3. How many are there in Hydrogen? __________________________________

*Now click on the **Shell View**.*

1. What does the pink particle represent? Fill in the pink particle row in the chart above.

2. What charge does it have? ____

3. How many are there? ____

*Now choose **Neon**, and choose the **Nucleus View**.*

4. What do the black particles represent? Fill in the black particle row in the chart above.
5. How many red particle are there in Neon? _____________________________

6. What is Neon's atomic number? ______________________________________

*Now choose **Shell View**.*

7. How many pink and yellow particles are there in Neon? __________________

8. How many pink particles are in the first shell of Neon? __________________

9. How many yellow particles are in the second shell of Neon? _____________

10. How much Neon would $100.00 get you? _____________________________

11. What is Neon used for? ____

*Now choose **Beryllium**, and choose the **Nucleus View**.*

12. How many black particles are there in Beryllium? ______________________

13. How many red particles are there in Beryllium? _______________________

*Now chose the **Shell View**.*

14. How many pink and yellow particles are there in Beryllium? _____________

15. What is Beryllium's atomic number? ___________________________________

16. How many protons does Beryllium have in its nucleus? ________________

17. How many electrons does Beryllium have in its shell? _________________

18. How many electrons are in the first energy level in Beryllium? __________

19. How many electrons are in the second energy level in Beryllium? ________

20. How much Beryllium could you buy with $100? _______________________

21. What is Beryllium used to make? ___________________________________

Name:________________________________

Proton, Neutron, Electron HW

What does the sub prefix in subatomic mean?

Therefore, what does the word subatomic mean?

What are the three subatomic particles?

____

____

____

Which subatomic particle(s) have mass?

Which subatomic particle(s) have charge?

Identify the subatomic particle in each description below:

This particle has substantial, a lot of, mass and no charge:

____

This particle has negligible, very little, mass and a negative charge:

____

This particle has substantial, a lot of, mass and a positive charge:

____

Name:_________________________________

Name:________________________________

Atomic Model Kits Activity

Using the atomic model kits, build an atom with the following numbers of subatomic particles. When you believe they are in the correct locations, have your sheet stamped by your teacher.

1.

	Number
Protons	5
Neutrons	6
Electrons	5

What is the total mass of this atom? __________
Who is this atom? _______

2.

	Number
Neutrons	4
Protons	3
Electrons	3

What is the total mass of this atom? __________
Who is this atom? _______

3.

	Number
Electrons	15
Neutrons	16
Protons	15

What is the total mass of this atom? __________
Who is this atom? _______

4.

	Number
Protons	18
Neutrons	22
Electrons	18

What is the total mass of this atom? __________
Who is this atom? _______

Name:_______________________________

5.

	Number
Electrons	4
Neutrons	5
Protons	4

What is the total mass of this atom? __________
Who is this atom? _______

STA

6.

	Number
Neutrons	10
Protons	9
Electrons	9

What is the total mass of this atom? __________
Who is this atom? _______

STAMP

7.

	Number
Electrons	34
Neutrons	45
Protons	34

What is the total mass of this atom? __________
Who is this atom? _______

STAMP

8.

	Number
Protons	11
Neutrons	12
Electrons	11

What is the total mass of this atom? __________
Who is this atom? _______

STA

9.

	Number
Neutrons	18

Name:________________________________

Protons	17
Electrons	17

What is the total <u>mass</u> of this atom? __________
Who is this atom? _______

Atomic Charting

There are three subatomic particles. Protons, neutrons, and electrons.

1. Which of these have substantial mass? _______________________________________

2. Which of these have electromagnetic charge? _______________________________________

For this page, ASSUME CHARGE IS ZERO.

Name	Symbol	Atomic #	Mass #	Protons	Neutrons	Electrons	Charge
Lithium- 7							0
Lithium- 9							0
Phosphorus-31							0
Oxygen- 16							0
Boron- 11							0
Sodium- 23							0
Nitrogen- 14							0
Aluminum-27							0
Argon- 40							0
Argon- 39							0
Argon- 38							0
Magnesium-24							0
Sulfur- 33							0
Phosphorus-34							0
Carbon- 14							0
Beryllium- 9							0
	Ba		136				0
		22	41				0
		26			50		0
					44	32	0

	Al				14		0
		15	30				0

Name:______________________________________

Name:________________________________

More Atomic Charting

Alternate turns with you partners using different colored pencils. Work left to right, filling in the missing information. While your partners work, coach them to ensure the right answer.

Name	Protons	Electrons	Neutrons	Mass
Hydrogen				2
	7		9	
		6		14
Phosphorus			16	
	28			59
		12	12	
Iron				56
	26		29	
		17		35
Lithium			4	
lead	82	82	125	207
gold	79	79	120	199

Name:________________________________

Name:_______________________________

Bill Nye "Atoms"

1. What are things made of?

____

2. What pieces are "unbreakapartable"?

____

3. Where are the heavy particles of an atom located?

____

4. What two particles are in the nucleus of an atom?

____

5. How far are the electrons from the nucleus of the 'properly proportioned model of science'?

____

6. If atoms are like letters, what are like words?

____

7. How many hydrogens are in water? How many oxygens?

____

8. What elements are in dynamite?

____

9. What are inside of protons and neutrons?

____

10. What is the big pile of Carbon by Bill's feet?

____

Name:________________________________

Name:________________________________

Top Secret! For Your Eyes Only

Because of your expertise in such matters, you have been chosen for a top secret mission. Your mission is to work with the "photographs" of the suspicious characters on the secret agent sheet. They are part of a family of secret agents but the most feared of them all has never been photographed. Your job is to arrange the photographs in a pattern so that you can make a composite drawing of the missing secret agent.

Here are some clues. If you had the numbers from 0 to 99 written on little squares of paper, and were told to arrange them, you could put them in order with each number one greater than the last. Once they are in one long row 100 squares long, WITHOUT CHANGING THE ORDER, break the sequence so that there are similarities in columns as well as rows such as:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	etc.								

Notice that each number is one greater than the last. Also, now there is organization in columns as well -- all the numbers in a column end in the same digit and begin with digits in consecutive order. And, finally, all the numbers in a row begin with the same digit. It might be useful to point out here that "columns" are vertical lists of numbers, and "rows" are horizontal strings of numbers.

Use the idea described above with the "photographs". After cutting apart the photos, arrange them in one single line, using one of the two ways in which each little man is DIFFERENT from every other. Once you have that arrangement, break the sequence (as done with the numbers above) so that you have commonalities in columns as well as rows. Remember to keep the original arrangement as you do this! (Hint: unlike the numbers, all columns and rows need not have the same number of squares)

Once you have the correct arrangement, you will be able to draw the missing secret agents picture. Draw him/her and add his/her "photograph" to your chart.

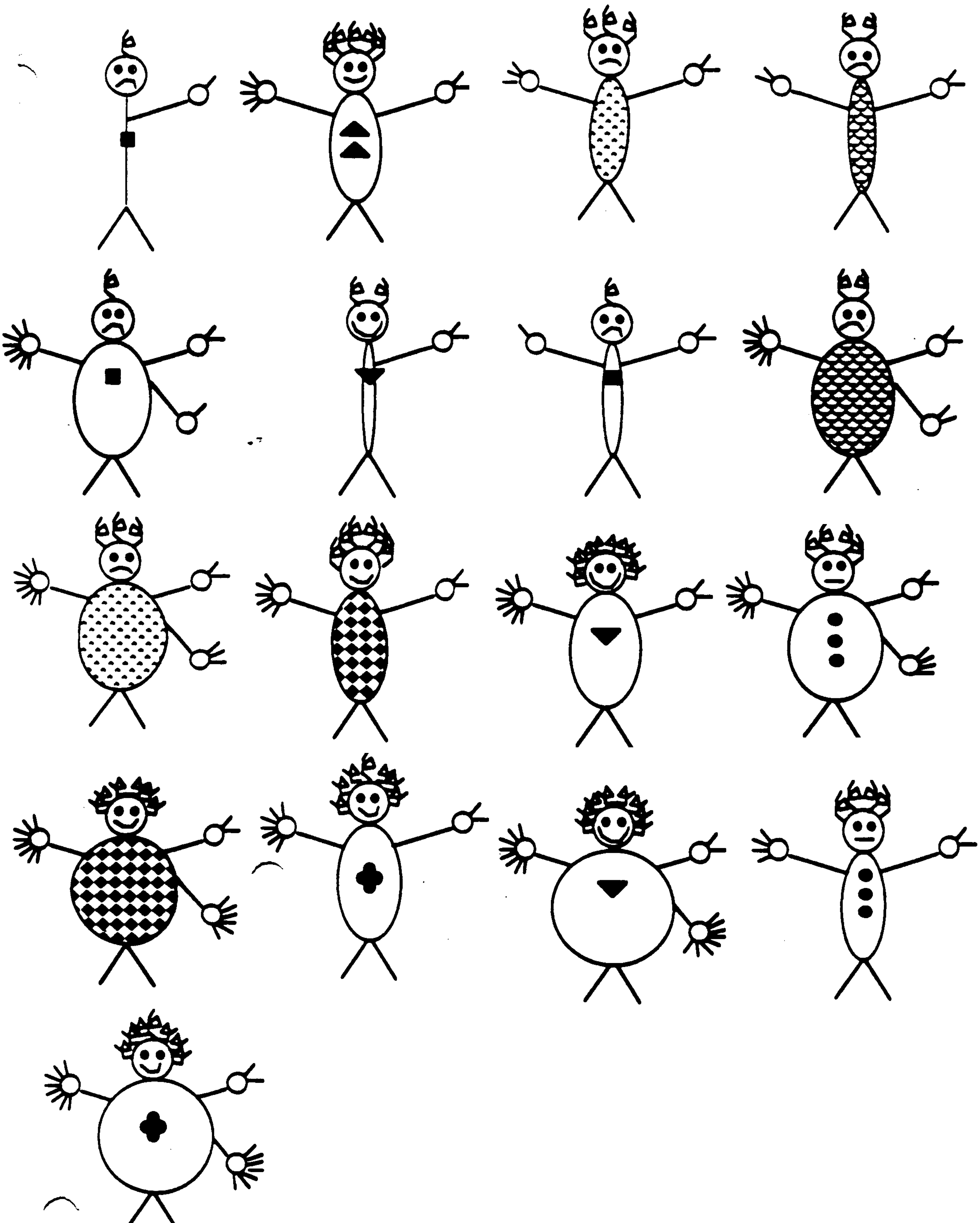
On another sheet of paper answer the following questions:

1. List ALL the relationships that you see in the pictures as you look down a column.

2. List ALL the relationships that you see in the pictures as you look across a row.

Staple the answers to these questions to your chart and hand in.

Name:___________________________________



Name:________________________________

Name:________________________________

Reading Guide: The Periodic Table
Chapter 17 Section 3
(Pages 517-524)

1. Define the word periodic.

What does this have to do with Chemistry?

2. Use the periodic table to answer the following questions.

What is the atomic number of Vanadium?	
Is Germanium a Metal, Nonmetal or Metalloid?	
What is symbol for Potassium?	
Which element has the symbol Hg?	
What are elements 58-71 called?	

3. Describe the relationship between Energy Levels and Rows on the periodic table.

4. What years were the most recent elements discovered/created?

5. What are the most common elements in universe? What are the most rare?

Name:________________________________

Title: Atomic Mass vs. Atomic Number

Name:________________________________

The Organization of the Periodic Table

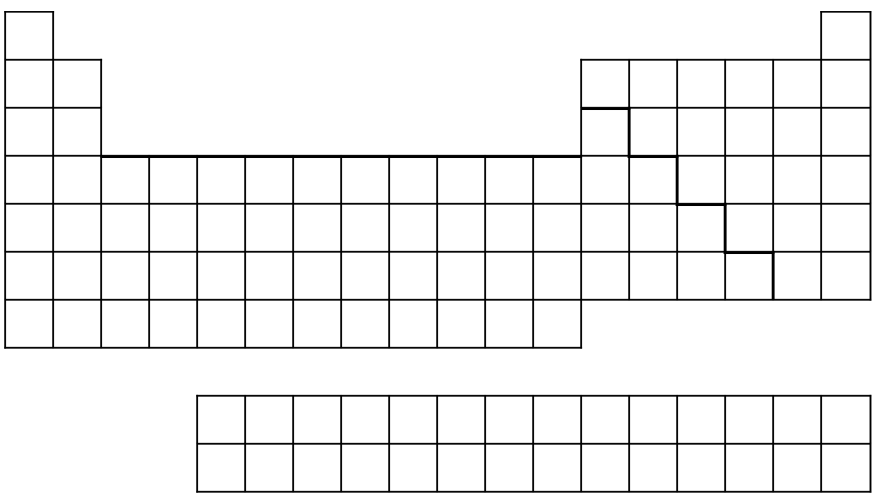
The Periodic Table is organized in several different ways. Consider the meaning of the word periodic. It literally means (according to Webster) "occurring at repeating regular intervals." This is an important definition. Many characteristics of the elements in the table are periodic. They have noticeable trends that repeat at regular intervals. After today you will begin to understand some of the intricacies of the Periodic Table and the valuable information it shows.

DIRECTIONS: Read each of the following sections. The information contained within them is very important. Then follow the directions for coloring and labeling a periodic table. You should do all colors and labels on the same sheet. Make a key on your table also.

Division of the Periodic Table into Metals, Non-metals, and Metalloids

The dark stair-step line you see on most periodic tables is what separates the metals and non-metals. All elements to the left of the line are considered metals (with the exception of Hydrogen) and all elements to the right are non-metals. The elements whose boxes actually touch the line are called metalloids. These elements can behave as a metal or a non-metal in certain compounds. The metalloids typically obey the stair-step rule however. For example, Aluminum is technically a metalloid, but in almost all cases it reacts chemically like a metal would. The elements at the bottom that are not connected to the periodic table are also considered to be metals.

COLOR: *Shade the metalloids yellow. Shade the non-metals blue. Put blue stripes in metalloids that act more like non-metals.*

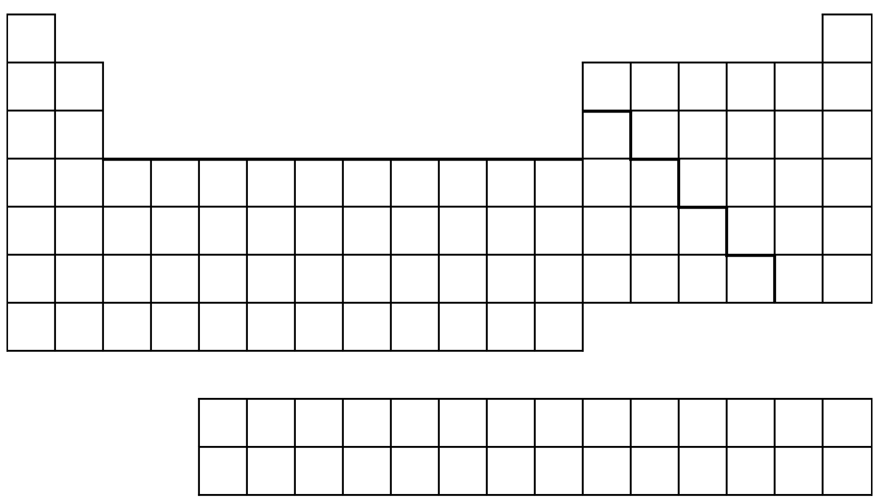


Name:___________________________________

II. Division of the Periodic Table into Representative Metals, Transition Metals and Rare Earth Metals

At the left of the periodic table, two columns are taller than the others. These metals are very important because they show the trends of how almost all metals react chemically. For this reason, they are called the representative metals because they "represent" the major characteristics of all metals. The center of the periodic table (the short columns) also consists of metals. These are called the transition metals: they make the transition between the metals and non-metals. The metals in columns 13, 14, 15, and 16 below the stair-step line can also be considered transition metals. Finally at the bottom of the table there are two rows which are disconnected. These elements are referred to as the Rare Earth Metals. The elements in this group are found in very low numbers on earth. Some do not even occur naturally. These elements behave differently than the representative metals and the transition metals. You will notice that the numbers do fit into the regular table in two spots, but with this modification, the table is too large to fit on a page. The top row of the rare earth metals is called the Lanthanide Series because the first element in the row is Lanthanum. The lower row of the rare earth metals is called the Actinide Series because the first element in the row is Actinium.

COLOR: *Shade the representative metals red. Shade the transition metals orange. Shade the Rare Earth Metals blue. Shade the metalloids yellow, but draw orange stripes in the metalloids that act more like metals (those BELOW the staircase line).*

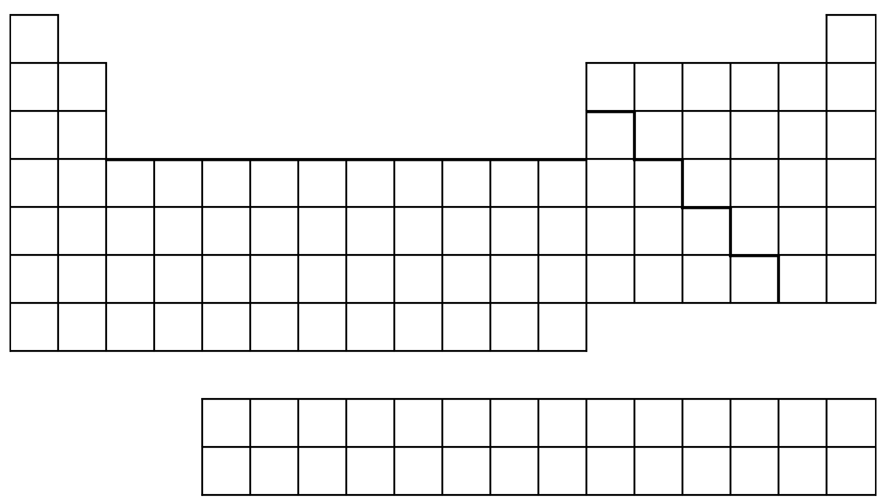


Name:________________________________

Division of the Periodic Table into Periods

This is a very important way to think about the arrangement of the elements. Remember Bohr's discovery that the electrons in the atom have various energy levels that they can be found on? Well, the rows of the periodic table, called the periods , show the different energy levels for the elements. ROWS (PERIODS) GO ACROSS. Energy level 1 can only have 2 electrons, right? Well there are only two elements in this row, H and He. The second energy level can have 8 electrons, and so eight more elements will fit in the period. The third energy level and beyond have some less intuitive patterns that we will not discuss in this class, but the periodic table helps us understand them. The periods in the periodic table are an important organizational tool for helping people understand the energy levels of the electrons.

LABEL: *First, number the rows on the periodic table 1-7 on the left side of the table. Do not number the rare earth metals. Then color each row of the table a different color. For the rare earth metals, color those the same as the rows 6 and 7 since that is where the elements would fit.*

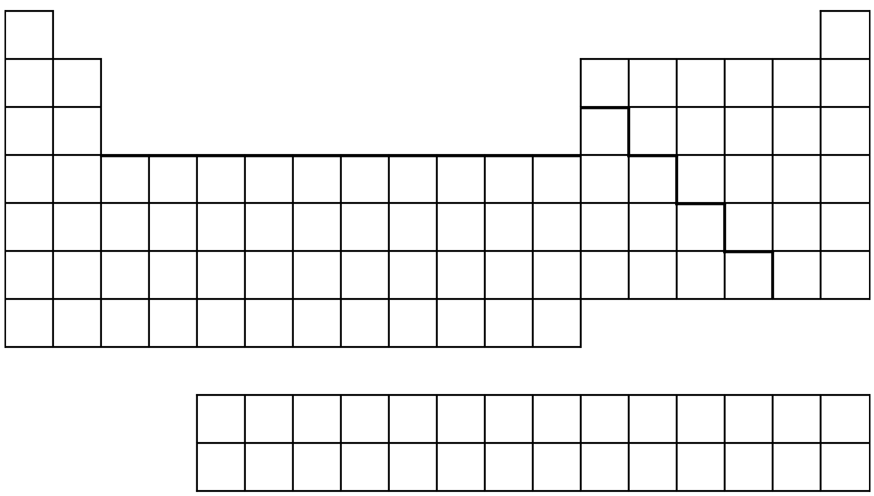


Name:________________________________

Division of the Periodic Table into Groups (Families)

The groups of the periodic table are the different vertical columns (COLUMNS GO UP AND DOWN). The groups are sometimes also called families. These groups are extremely valuable to scientists in predicting how elements will react chemically. The groups are also arranged by the electrons. Each element from the same group has the same number of valence electrons. *Valence electrons are the outermost electrons in an atom (at the highest energy level).* The valence electrons are responsible for all of the chemical bonding that an atom can do. Because this is such an important way to organize the table, many of the groups even have their own names. The first column on the left, Group 1 is known as the alkali metals. The second tall column, Group 2 is known as the alkaline earth metals. Group 17 is a very important group known as the Halogens. The last column on the periodic table is called the Noble Gases. The noble gases are the least reactive elements on the table. Sometimes the Noble Gases will be labeled Group 0 or Group 18.

LABEL: *Number the columns of the periodic table 1-18. Then color column 1 red, column 2 orange, column 17 green, and column 18 blue. Finally, label the correct columns as the alkali metals, the alkaline earth metals, the halogens, and the noble gases.*



Name:________________________________

Atom Basics

Answer the following questions using your notes.

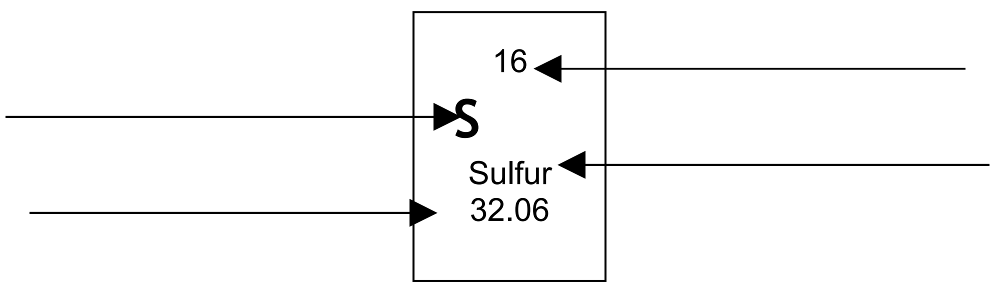
1. State the three subatomic particles of an atom. Provide their location within the atom. Be specific.

   a. ________________ Location: _____________________

   b. ________________ Location: _____________________

   c. ________________ Location: ____________________

2. Label the four parts within the box.



3. What does the atomic number represent? And state three "things" you know about the atomic number.

____

____

4. What does the atomic mass number represent?

____

5. When reading the periodic table of elements, how can you determine which number represents the atomic number and which number represents the atomic mass number?

____

____

Name:________________________________

6. Where is the majority of the mass located in the atom? Why is it there?

____

____

7. State if the number of each of the following can or cannot change within an atom:

   a. proton ____________________

   b. electron ____________________

   c. neutron ____________________

8. Why can the atomic mass number vary for a specific element?

____

____

Name:_______________________________

Element and Compound Comparison

Purpose: ____

Fill in the following data table.

Element								Compound		
Symbol	Element Name	Metal, metalloid, nonmetal	Color	Phase	Luster	Conductivity	Malleability	Formula	General Properties	Same as Element?
Al										
Bi										
Cd										
C										
Cr										
Co										
Cu										
S										
Fe										
Pb										
Mg										
Mn										
Ca										
Ni										
Si										
Zn										

Name:________________________________

Questions

1. Were most of these elements metals, metalloids, or nonmetals?

____

2. What phase were most of these elements in?

____

3. Do elements have similar properties when compared to their compounds?

____

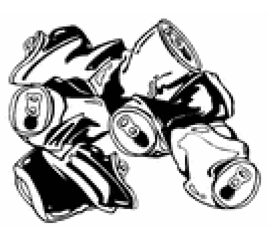
4. What are two properties that all metals have in common?

____

____

5. Do non-metals conduct electricity?

____



Name:________________________________

History of the Periodic Table reading

In 1869 Mendeleev, a Russian chemist, showed the first version of his periodic table. This table was the first coherent presentation of the similarities between elements. He noticed that classifying the elements by their atomic mass a periodicity in certain properties could be seen. The first table consisted of 63 elements.

This table was designed in such a way that the elements periodicity showed up. In this way the elements are classified vertically. The resulting vertical groupings represent the elements of the same "family".

In order to apply the law in which he believed, Mendeleev has to leave some hollow spaces.

Mendeleev lays out his table so the periodicity of the elements clearly appears. In this table, the elements are classified vertically (in the current classification they are arranged horizontally). The horizontal arrangements occur regularly as certain chemical and physical properties are repeated. In the vertical arrangements, we find that the elements have almost the same chemical properties and similarities in their physical properties.

To follow the periodic law in which Mendeleev firmly believed, he should sometimes modify the order determined by the atomic mass progression and leave certain places "hollow".

He was sure that we would finally discover the missing elements, (those elements correspondent to the question marks before the relative atomic masses 45, 68, 70 and 180), which would confirm how well based his theory was. More than that, he predicted the properties of the three missing elements by looking at the properties of the four neighbour elements. Between 1875 and 1886, these three elements (gallium, scandium and germanium) were discovered. Each one of them had the properties predicted by the Russian chemist. Until then, very few scientists had accepted the ideas of Mendeleev. But as soon as these predicted elements where discovered, presenting moreover very similar properties to the predicted ones, the scientists recognized the utility of his periodic table.

Even though it is true that Mendeleev's classification marks a clear progress over all the other previous attempts of classification, it still had certain anomalies owing to the atomic masses still badly determined at that time.

Name:________________________________

1. Why did Mendeleev's periodic table only have 63 elements on it?

____

____

2. How was Mendeleev's first periodic table arranged?

____

____

____

3. Why did Mendeleev's periodic table finally gain acceptance?

____

____

____

4. In the vertical arrangements, what do we see among the elements?

____

____

____

5. What does the term *hollow* refer to in the 3rd paragraph?

____

____

____

Name:________________________________

Periodic Table Movie
Physical Science in Action

During the video.

1. The ____________ ___________ is a map of the atoms and elements.

2. The first electron shell of an atom can only hold ___ electrons. The second electron shell can only hold ___ electrons. An atom can bond with another atom only if its outer electron shell IS NOT ________.

3. Dimitri Mendeleev studied and grouped elements by their ______________. This allowed him to develop the periodic table.

4. Draw and label the square on the periodic table for the element sulfur. Include the element name, symbol, atomic weight, and atomic number:

5. Atomic number is the number of ____________ in an atom of the element. Atomic Mass/Weight is the number of ____________ plus the number of _____________ in the atom of the element.

6. Not every atom of an element has the same number of _____________. The a____________ mass is the average mass of the atom of a particular element.

7. The periodic table has ____ rows called periods. Each element in the same ____________ has the same number of electron shells/orbits.

8. The periodic table has ______ columns called groups/families. Each element in the same group has the same number of electron(s) in its ___________ shell/orbit. In addition, the elements in each group share similar _________________.

9. Alkali, Alkaline Earth, Transition, Other, and Rare Earth are the classifications of _____________.

10. Metalloids have properties of both ___________ and ________________.

11. Metals _______________ heat and electricity easily. Nonmetals do not _______________ heat and electricity.

12. Halogens and Nobel Gases are ____________________.

13. Nobel gases have ____ electrons in their outer shell and are very stable; they do not react chemically.

Name:_________________________________

After the video.

Without looking at the periodic table, list all the elements that you can remember. Write each element’s name and symbol.

Name:________________________________

The Mystery Element

Study the mystery element in Figure 1. Use Figure 1 and the periodic table to answer these questions and identify the element.

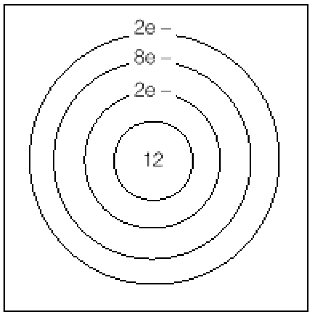


Figure 1 Mystery Element

1. The number in the nucleus tells how many protons are in the nucleus. What else does it tell you about the element?

____

2. The three largest rings represent electron energy levels. How many electrons travel are in the second energy level?

____

3. Do the elements above and below this one in the periodic table have similar properties? Explain your answer.

____

4. To which period does the element belong? ____________________________

5. To which group does the element belong? _____________________________

6. Name two other elements with similar properties. ___________________________
____

7. Give the symbol and name of the element in Figure 1.

   symbol = _______ name = ___________________________________

8. Is this element a metal, a metalloid, or a nonmetal? How do you know?

____

9. What is the atomic number of the element just to the left of the element in Figure 1?
   ____

10. How many electrons does the element just to the right of this one have?
   ____

Is the element to the right of this one a metal, a metalloid, or a nonmetal?
____

Name:__________________________________

Name:________________________________

Alien Periodic Table

Introduction:

Imagine that scientists have made radio contact with life on a distant planet. The planet is composed of many of the same elements as are found on Earth. However, the inhabitants of the planet have different names and symbols for the elements. The radio transmission gave data on the known chemical and physical properties of 30 elements that belong to Groups 1, 2, 13, 14, 15, 16, 17, and 18. You need to place the elements into a blank periodic table based on these properties.

Problem: Where do the alien elements fit in the periodic table?

Procedure:

1. Listed below are data on the chemical and physical properties of the 30 elements. Write the elements in their proper position in the blank periodic table.
2. Once you have determined the proper position for each element, then write the symbol in the correct place.
   - ❑ The noble gases are bombal (Bo), wobble (Wo), jeptum (J), and logon (L). Among these gases, wobble has the greatest atomic mass and bombal the least. Logon is lighter than jeptum.

   - ❑ The most reactive group of metals are xtalt (X), byyou (By), chow (Ch), and quackzil (Q). Of these metals, chow has the lowest atomic mass. Quackzil is in the same period as wobble.

   - ❑ Apstrom (A), vulcania (V), and kratt (Kt) are nonmetals whose atoms typically gain or share one electron. Vulcania is in the same period as quackzil and wobble.

   - ❑ The metalloids are ernst (E), highho (Hi), terriblum (T), and sississ (Ss). Sississ is the metalloid with the greatest atomic mass. Ernst is the metalloid with the lowest atomic mass. Highho and terriblum are in Group 14. Terriblum has more protons than highho. Yazzer (Yz) touches the zigzag line, but it's a metal, not a metalloid.

   - ❑ The lightest element of all is called pfsst (Pf). The heaviest element in the group of 30 is eldorado (El). The most chemically active nonmetal is apstrom. Kratt reacts with byyou to form table salt.

   - ❑ The element doggone (D) has only 4 protons in its atom.

   - ❑ Floxxit (Fx) is important in the chemistry of life. It forms compounds of long chains of atoms. Rhaatrap (R) and doadeer (Do) are metals in the fourth period, but rhaatrap is less reactive than doadeer.

Name:________________________________

- ❑ Magnificon (M), goldy (G), and sississ are all members of Group 15. Goldy has fewer total electrons than magnificon.
- ❑ Urrp (Up), oz (Oz), and nuutye (Nu) all gain 2 electrons when they react. Nuutye is found as a diatomic molecule and has the same properties as a gas found here in Earth's atmosphere. Oz has a lower atomic number than urrp.
- ❑ The element anatom (An) has atoms with a total of 49 electrons. Zapper (Z) and pie (Pi) lose two electrons when they react. Zapper is used in flashbulbs.

Analysis Questions:

1. List the name of each alien element and the Earth element that it represents. Do this for all 30 elements used in this activity. (write small)

____

____

____

____

____

____

____

____

2. Were you able to place some elements within the periodic table with just a single clue? Explain your answer using two examples from the activity.

____

____

____

3. Why did you need two or more clues to place other elements? Explain your answer using one specific example from the activity.

____

____

____

____

Name:________________________________

4. Why could you use clues about atomic mass to place elements, even though the periodic table is based on atomic number?

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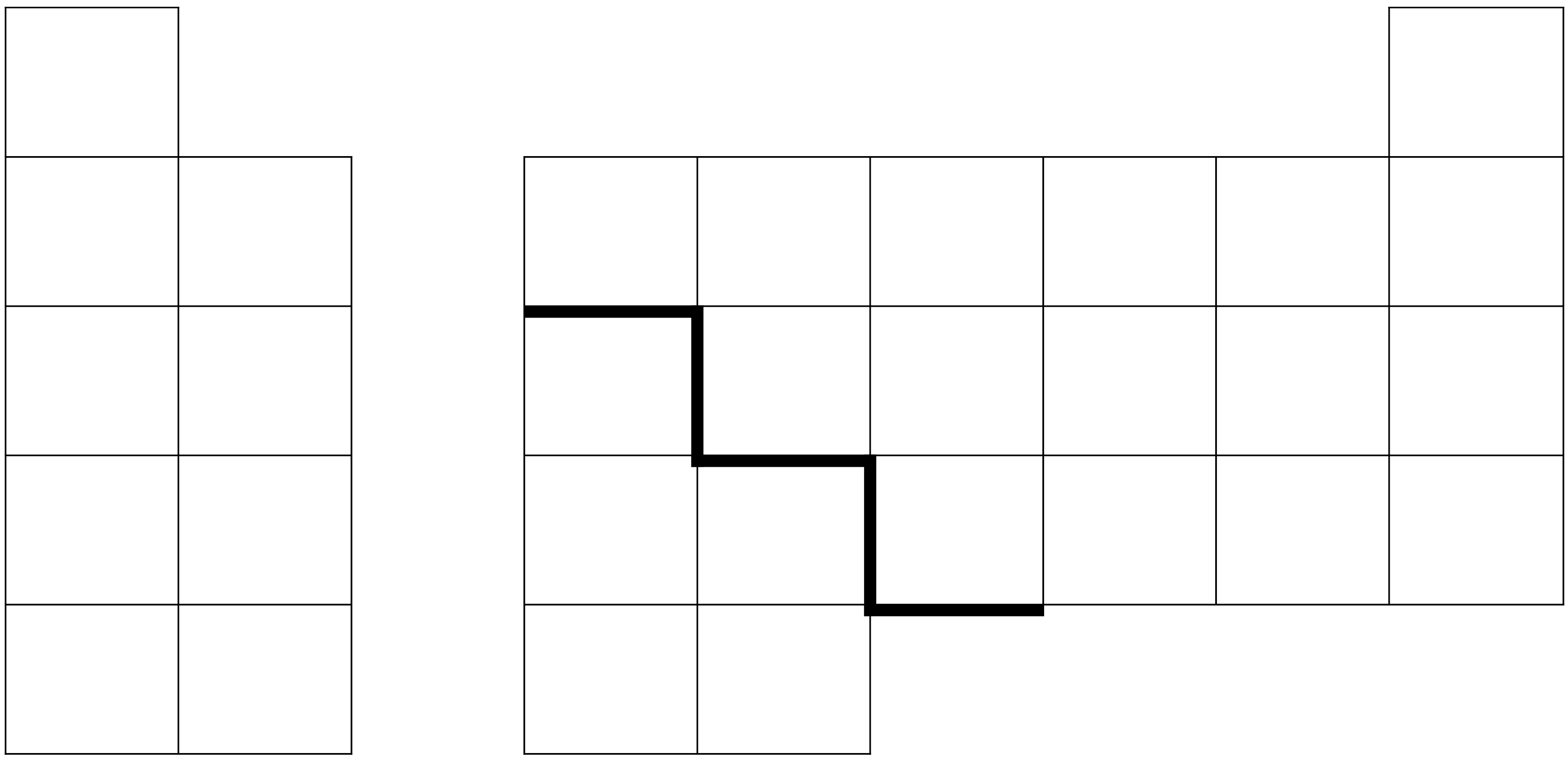
Name:______________________________

Alien Periodic Table

1 2 13 14 15 16 17 18

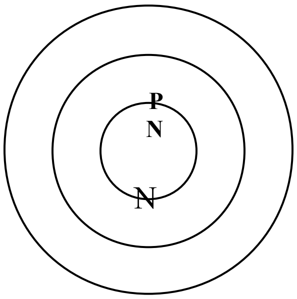


Name:________________________________

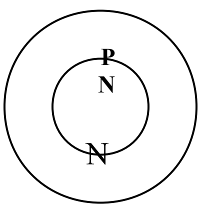
Electron Clouds

Use the information provided for each element to complete the diagram. Draw the electrons in their proper levels, and place the correct numbers in the nucleus to indicate the number of protons and the number of neutrons.

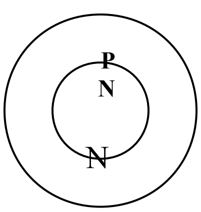
1. Sulfur: atomic number 16
   mass number 32



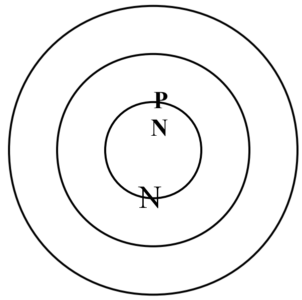
2. Beryllium: atomic number 4
   mass number 9



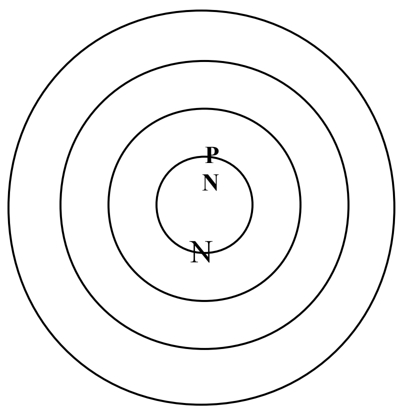
3. Nitrogen: atomic number 7
   mass number 14



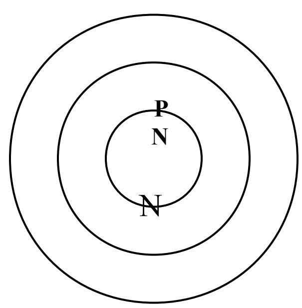
4. Sodium: atomic number 11
   mass number 23



5. Potassium: atomic number 19
   mass number 39



6. Argon: atomic number 18
   mass number 40



Name:________________________________

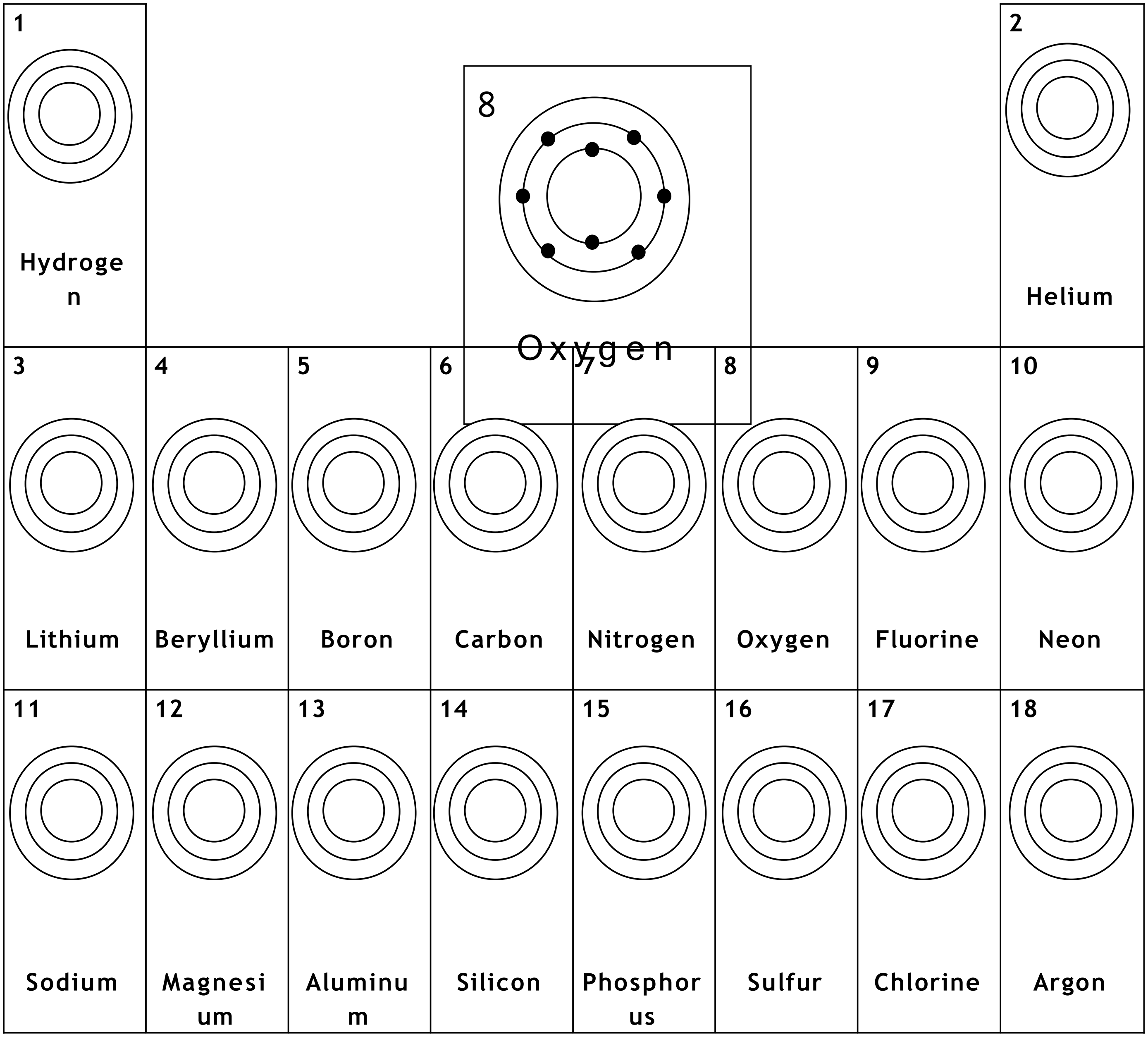
Electron Clouds and Lewis Dot Structures

Valence electrons, or the outermost electrons, are believed to be the reason that all bonding occurs between atoms. On the first page, you are going to draw all of the electrons in their shells. On the second page, you are going to practice identifying valence electrons and draw Lewis Dot Structures of those valence electrons. Finally, you will look for patterns in the valence electrons which might explain the different chemical properties of elements.

Name:________________________________

For each element:

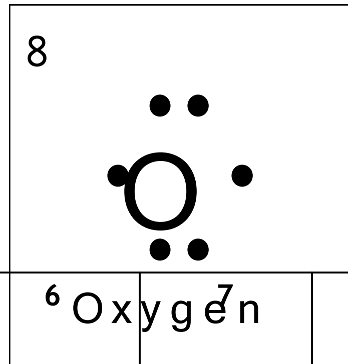
Draw <u>all the electrons</u> in the appropriate electron clouds like the example below.



Name:___________________________________

For each element:

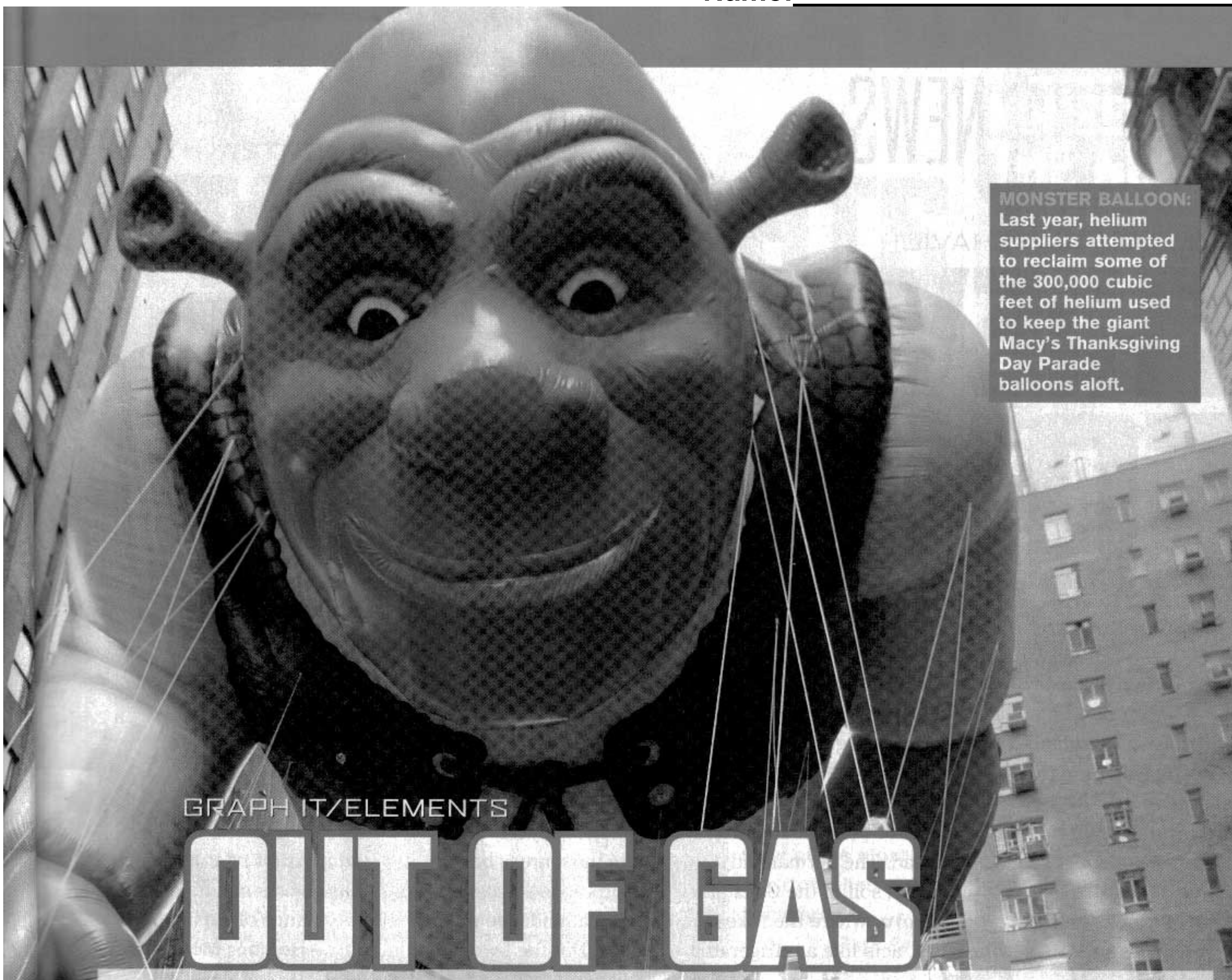
Draw the valence electrons in the Lewis Dot Structure like the example below.



1 **H** Hydroge n							2 **H** Helium
3 **Li** Lithium	4 **Be** Beryllium	5 **B** Boron	6 **C** Carbon	7 **N** Nitrogen	8 **O** Oxygen	9 **F** Fluorine	10 **Ne** Neon
11 **Na** Sodium	12 **Mg** Magnesi um	13 **Al** Aluminu m	14 **Si** Silicon	15 **P** Phosphor us	16 **S** Sulfur	17 **Cl** Chlorine	18 **Ar** Argon

1. All elements in Group 3 have ____________ valence electrons.
2. All elements in Group 4 have ____________ valence electrons.
3. All elements in Group 5 have ____________ valence electrons.
4. All elements in Group 6 have ____________ valence electrons.
5. All elements in Group 7 have ____________ valence electrons.
6. All elements in Group 8 have ____________ valence electrons.
7. A way of showing valence electrons for atoms is to draw a _______________________________.

Name:________________________________



MONSTER BALLOON: Last year, helium suppliers attempted to reclaim some of the 300,000 cubic feet of helium used to keep the giant Macy's Thanksgiving Day Parade balloons aloft.

COFFIN: ANDREAS F. VOEGELIN/ANTIKENMUSEUM/BASEL & SAMMLUNG LUDWIG; KING TUT: BEN CURTIS/AFP/GETTY IMAGES; BALLOON: HIROKO MASUIKE/GETTY IMAGES

GRAPH IT/ELEMENTS

OUT OF GAS

Helium may be the second-most abundant element in the universe, but here on Earth we're in short supply. A high demand for the gas and a dwindling stash are making it scarcer than ever. "Worldwide demand for helium is ballooning," says Bureau of Land Management spokesman Hans Stuart.

During WWII, the United States government began stockpiling helium needed to fill up blimps in an underground reserve near Amarillo, Texas. Today, nearly half of the helium used annually in the U.S. and one third of the world comes from that supply. At this rate of use, the reserve will dry up by 2017.

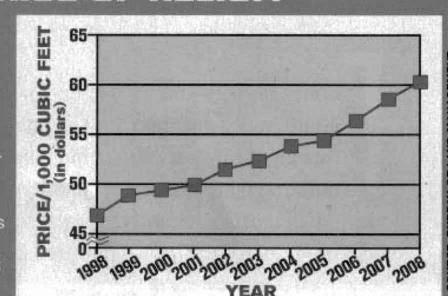
Why is helium so popular? The gas has a lower *density* (mass per volume) than air, so it keeps party balloons afloat. Doctors and scientists also use helium to cool hospital imaging machines and physics lab equipment. That's because helium's low *boiling point*, or temperature at which it changes from a liquid to a gas, makes it one of the coldest gases. Even NASA relies on the gas to keep rocket fuel under pressure. Since helium is *inert*, it won't burn or react with the fuel during takeoff.

To keep up with helium demand, companies in the U.S. and abroad are now looking for new sources of helium underground. "Hopefully, this is just a temporary shortage," says Stuart.

—Corey Binns

RISING PRICE OF HELIUM*

The United States' government supplies much of the world's helium. Increased demand for the gas and a dwindling U.S. supply have caused helium prices to rise. How much has the price of helium gone up from 1998 to 2008?



* Prices of crude, or unpurified, helium sold from the government's reserve.

Name:________________________________

1. Make a Data Table Showing the recent rise in the price of helium

2. Why is the price of helium rising?

3. How do they get helium? Name two ways.

4. What does the word dwindling mean in the passage?

5. Name 4 uses for helium

6. What does the word inert mean in the passage?

Name:________________________________

Ions Charting

For this page, do NOT assume the charge is zero.

Name	Symbol	Atomic #	Mass #	Protons	Neutron	Electrons	Charge
Lead-207							+4
Calcium-40						18	
	O^{2-}		18				-2
Silver-109						46	
	Sn^{+4}				68		
			37	17		18	
				19	21		+1
				24	24	21	
	Al^{+3}		26				
			107		60		+1
		15			16	18	
Bromine-81							-1
Bromine-82							0
		56		56			+2
			32			18	-3
			44	21			+3
Iron-55							+3
Iron-54						24	
	Ag^{+}			51	53		
		27	57			24	
		80	120				+1
	V^{5+}		49				
Tellurium-127							-2
				52	42		+6

Name:________________________________

Name:________________________________

Gold Penny Lab

Introduction:

After you've glanced at your car, you notice that it is a little sad looking. Some nice solid gold spinners would make it look perfect, but that's just too expensive! You do have some hubcaps made of copper….what to do? That's where chemistry comes to the rescue.

Materials:

25 mL graduated cylinder	Hot Plate
3 M Sodium Hydroxide	Beaker Tongs
Electronic Balance	Watch Glass
Granulated Zinc	Three Pennies
100 mL Beaker	Forceps
250 mL or 400 mL Beaker	

Pre-Lab Questions:

Read through the procedure on the following page, and then answer these questions.

a. State the independent variable in this experiment:

____

b. State the dependent variable in this experiment.

____

c. State the control (or control group) in this experiment:

____

d. Identify one variable that will be controlled (or held constant) during this experiment:

____

e. State a logical hypothesis for this problem:

____

____

____

Name:________________________________

Procedure:

1. Take the 25 mL graduated cylinder and measure 15 mL of sodium hydroxide (NaOH). **BE CAREFUL!**

2. Weigh out 0.5 grams of zinc on the electronic balance.

3. Place two of your pennies flat into the 100 mL beaker. Keep the third penny as your control penny.

4. Place the 15 mL of sodium hydroxide (NaOH) into the 100 mL beaker that has your two pennies.

5. Place the 0.5 grams of zinc into the same 100 mL beaker.

6. Place your beaker on the hot plate and set at 7.

7. Place the watch glass onto the 100 mL beaker to stop evaporation of the sodium hydroxide.

8. Fill the 250 mL or 400 mL beaker about half full with tap water.

9. When the pennies appear to have made a color change remove the 100 mL beaker from the hot plate using the beaker tongs.

DO NOT REACH INTO THE BEAKER WITH YOUR FINGERS UNDER ANY CONDITION!

10. Using your forceps remove both of the pennies from the 100 mL beaker and place into your beaker of water. After one minute dry the pennies and note any changes that have occurred on the data table.

11. Bring one of the pennies to the teacher to show you how to flame the penny.

12. Note any changes that have occurred to your third penny in the data table.

Name:________________________________

Data Table:

Condition	**Observation**
Control Penny (nothing was done to this penny)	
Penny boiled in sodium hydroxide and zinc	
Penny boiled in sodium hydroxide and zinc and then was flamed	

Questions:

1. Explain why the first color change was a physical change.

2. Explain why the second change was a chemical change.

3. Why was one penny left alone? What was the purpose of this penny? What does this mean?

Name:________________________________

Name:__________________________________

Filling in Periodic Squares

8 O Oxygen 15.999

← ________________
← ________________
← ________________
← ________________

Atomic number equals the number of

__________ **or** __________

Atomic mass equals the number of

__________ + __________

8 O ________ 15.999	30 ___ Zinc 65.39	3 Li ________ 6.941
Atomic # = _____	Atomic # = _____	Atomic # = _____
Atomic Mass = _______	Atomic Mass = _______	Atomic Mass = _______
# of Protons = ______	# of Protons = ______	# of Protons = ______
# of Neutrons = ______	# of Neutrons = ______	# of Neutrons = ______
# of Electrons = ______	# of Electrons = ______	# of Electrons = ______

14 ___ Silicon 28.086	5 B ________ 10.81	35 ___ Bromine 79.904
Atomic # = _____	Atomic # = _____	Atomic # = _____
Atomic Mass = _______	Atomic Mass = _______	Atomic Mass = _______
# of Protons = ______	# of Protons = ______	# of Protons = ______
# of Neutrons = ______	# of Neutrons = ______	# of Neutrons = ______
# of Electrons = ______	# of Electrons = ______	# of Electrons = ______

Name:___________________________________

16 S ________ 32.06	53 _____ Iodine 126.905	25 Mn ________ 54.938

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

12 Mg ________ 24.305	18 ___ Argon 39.948	19 K ________ 39.098

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

79 ___ Gold 196.967	1 H ________ 1.008	9 ___ Fluorine 18.998

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

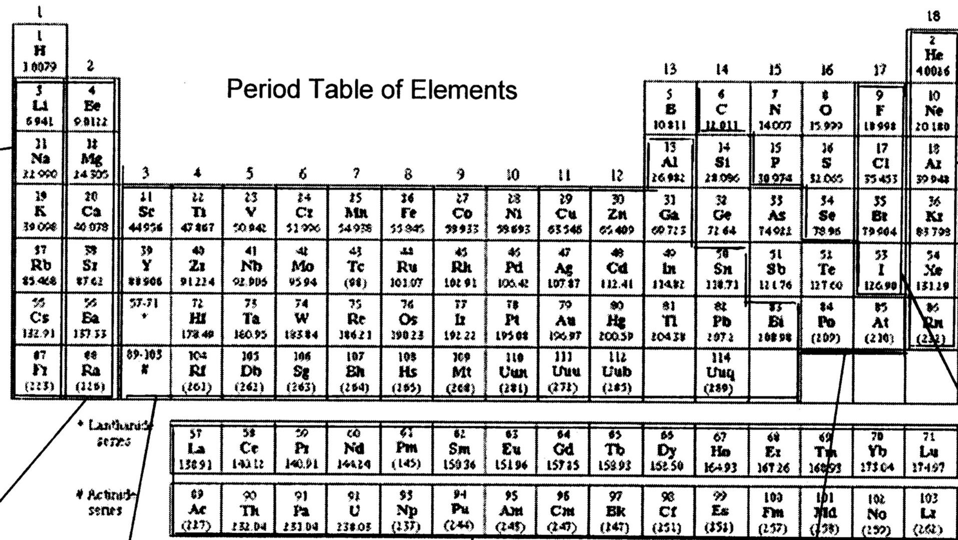
Atomic # = _____
Atomic Mass = ________
of Protons = _______
of Neutrons = _______
of Electrons = _______

Name:________________________

Definitions

Element	Group
Periodic	Period

Period Table of Elements



Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name

Elements

3 Similar Properties

Name:________________________________

Questions:

1. Who created the first periodic table of elements?

____

2. How many elements were known at the time of the first periodic table?

____

3. How many elements are known today (see the periodic table on the other side)?

____

4. What properties did Mendeleev use to categorize his elements?

____

5. What two problems did Mendeleev run into while categorizing his elements?

____

6. What did Moseley do differently than Mendeleev?

____

7. What two properties are used to categorize elements on the modern periodic table?

____

Name:________________________________

Measure Your Radiation Exposure

1. Where you live?

a. Cosmic Radiation

Altitude (ft)	Radiation (mrem)	Altitude (ft)	Radiation (mrem)
Sea level	26	4000-5000	47
0-1000	28	5000-6000	52
1000-2000	31	6000-7000	66
2000-3000	35	7000-8000	79
3000-4000	41	8000-9000	96

b. Terrestrial radiation (from the ground)

If you live in a state bordering the Gulf or Atlantic coasts 16 mrem

If you live in AZ, CO NM or UT 63 mrem

If you live anywhere else in the continental US 30 mrem

c. House construction

If you live in stone, adobe, brick or concrete building 7 mrem

d. Power Plants

If you live within 50 miles of a Nuclear Power Plant 0.009 mrem

If you live within 50 miles of a Coal-fired Power Plant 0.03 mrem

Total for Where You live

2. Food, Water, and Air

Internal Radiation (based on average values)

From food (C-14 and K-40, and water (radon dissolved in water) 40 mrem

From air (from radon) 200 mrem

3. How you live

Name:________________________________

Condition	Radiation (mrem)	Your Exposure
a. Weapons test fallout	1	
b. Travel by jet aircraft	0.5 mrem /hour	
c. If you have porcelain crowns or false teeth	0.07	
d. If you wear a luminous wristwatch	0.06	
e. If you go through airport security (each time)	0.002	
f. If you watch TV	1	
g. If you use a video display (computer screen)	1	
h. If you live in a dwelling that has a smoke detector	0.0008	
i. If you use a camping lantern with an old mantle	0.2	
j. If you where a plutonium powered pacemaker	100	
Total for How you live		

4. Medical uses (radiation per procedure)

Condition	Radiation (mrem/use)	Your exposure
a. Dental X-ray	1	
b. Extremity (arm, hand, foot, or leg)	1	
c. Chest	6	
d. Pelvis /Hip	65	
e. Skull /Neck	20	
f. Barium Enema	405	
g. Upper GI	245	
h. CT scan (head or body)	110	
i. Nuclear medicine (e.g. thyroid scan)	14	
Total for Medical Uses		

Section	Total (mrem)
Where You Live	
Food, Water, and Air	
How you live	
Medical Uses	
Total Radiation in the past Year (mrem)	
Total Radiation (rem)	

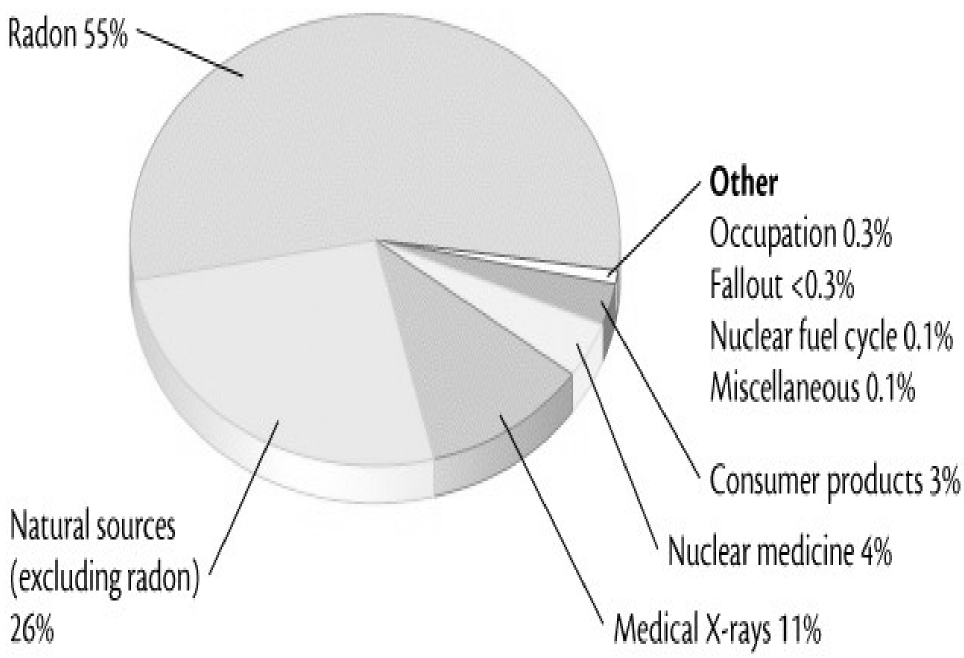
Radiation Effects

Dose (rem)	Effect
0–25	No immediate observable effects.
25–50	Small decreases in white blood cell count, causing lowered resistance to infections.
50–100	Marked decrease in white blood cell count. Development of lesions.
100–200	Radiation sickness—nausea, vomiting, hair loss. Blood cells die.
200–300	Hemorrhaging, ulcers, deaths.
300–500	Acute radiation sickness. Fifty percent die within a few weeks.
>700	One hundred percent die.

The US recommends that you have a 0.5 rem (or 500 mrem) dose per year.

Name:_________________________________

The Pie chart below shows the main sources of radiation for an average person in the United States.



Name:________________________________

Name:________________________________

Reading Guide: Radioactivity
Chapter 18 Section 1
(*Pages 536-540)*

1. Predict if the particles will attract, repel, or do nothing.

Proton and Electron	
Proton and Proton	
Electron and Neutron	
Proton and Neutron	

2. Define the following terms.

Radioactivity	
Isotope	
Stable	

3. Summarize the story of the discovery of radioactivity.

Name:_________________________________

Nuclear Chemistry

The sun and stars are seemingly inexhaustible sources of energy. That energy is the result of nuclear reactions, in which matter is converted to energy. Scientists tried for years to understand and harness the energy of the sun and stars. We now know that the stars are powered by **Nuclear Energy.** Nuclear energy is the energy that is stored in the nucleus of an atom. There are a few different ways to get at this nuclear energy.

The first is a process called **Nuclear Fusion.** Nuclear fusion is the way that the sun and stars are powered. In nuclear fusion, two small atoms combine to form one new larger atom. In these very tiny atoms, there is **a lot** of energy stored. With enough atoms undergoing fusion, you get a lot of hot! Hydrogen turns into Helium in Nuclear Fusion in most stars.

A second process is what we call **Radioactivity**. Some elements have **isotopes**, atoms with the same amount of protons, but a different number of neutrons, that are unstable. They fall apart naturally over time. This process of falling apart is called radioactivity.

The second process is called **Nuclear Fission.** Nuclear Fission is the process where one large atom is split into two smaller atoms. The same energy that is stored in the atoms from Fusion is stored in the large Fission atoms. The only difference is that Fission releases less energy. Uranium turns into Krypton and Barium, two smaller elements.

We have been able to harness the power of nuclear fission for use in power plants. Presently, nuclear energy provides for approximately 16% of the world's electricity. Scientists are working like madmen to make fusion reactors, which have the potential of providing more energy with fewer disadvantages than fission reactors.

Stars

Stars begin as very loose clouds of dust and gas. Hydrogen makes up about 90% of these clouds called, **nebulae**. As gravity begins to take hold of this cloud, the dust and gas becomes more tightly packed together. This causes an increased interaction amongst the particles, and the molecules begin to increase their temperature. The more gravity acts, the hotter it gets.

As we recall, like charged particles repel each other. As this **proto-star**, or beginning star, begins to take shape. The nuclei of all the hydrogen particles are being forced together. The only thing holding them apart is this repulsion. When the gravity becomes greater than this repulsion, the nuclei of the hydrogens are forced together. Two hydrogens become one helium, and a whole lot of energy is released! This is the point of **stellar ignition.**

All of the energy that we use on the planet Earth has been supplied by our nearest star, the **Sun**. The Sun is an averaged sized star, yet it produces enough energy to support all of our wasteful habits (like eating and walking around). All of the energy we take in as food got its start as sunlight. All of the coal and oil we burn was originally sunlight. In fact, the Sun produces so much energy, that if we could capture all of it for one second, we could power the Earth for many millions of years!

Name:________________________________

Radioactivity

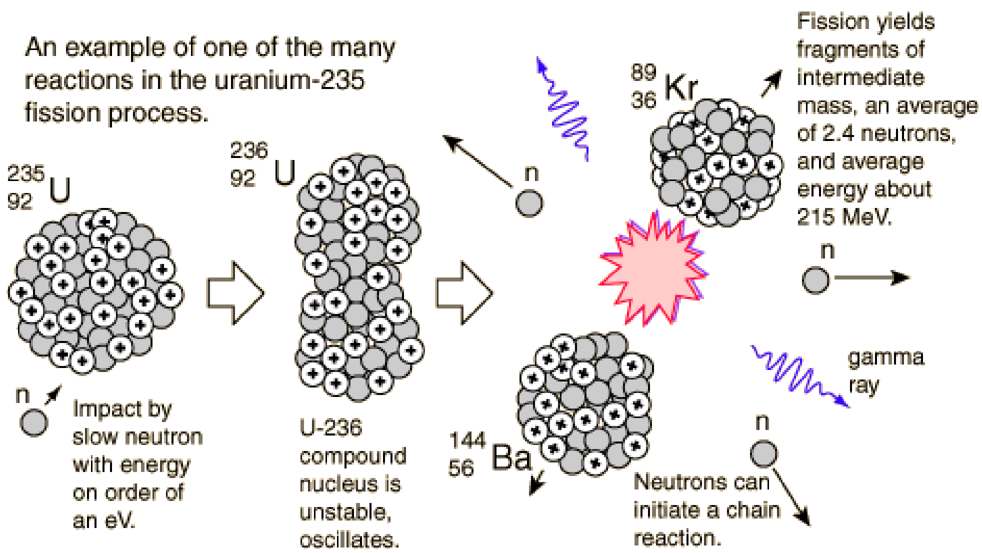
Have ever seen a movie where there is a nuclear accident, and things begin to glow green? Sometimes a superhero is born, and other times a giant lizard. While Hollywood usually gets it wrong, radioactivity can be a very serious problem. The energy and particles released from unstable isotopes of common elements can cause quite a few problems when living things are exposed to too many. Many times excessive exposure to radioactive elements can cause cancer, developmental problems in children, or DNA mutations.

There are a few types of radiation. Some are particles that leave an atom at high energy. They can be protons, neutrons, or some times even positively charged electrons called **positrons** (weird!). Other times it can simply be energy, such as X-rays or gamma rays (remember the Incredible Hulk?). In low levels some of these types of radiation can be quite helpful. From taking pictures of our insides, to dating fossils, radiation is not always the scary picture that the media paints.

Nuclear Power Plants

The element **Uranium** is the main fuel used to undergo nuclear fission to produce energy. There are many deposits of uranium in the United States and Africa. Its availability and the fact that we only need a little uranium to get a lot of energy make it a very good fuel

Shooting neutrons at them can easily split uranium nuclei. We use a certain type of neutron called a **thermal neutron** to split the nuclei (more than one nucleus) of uranium atoms. Each Uranium that is split release two or three more thermal neutrons. In this way we can have a **chain reaction**. A chain reaction occurs when one uranium atom splits and causes two or more to split.



Where does the heat come from? Mass is still conserved – if you add up all the subatomic particles you will end with the same number that you started with. The nuclear energy, or **binding energy,** the energy needed to hold the nucleus together, is released.. That is the energy that becomes heat.

If our **nuclear reactor** (the place where a nuclear reaction takes place in a power plant), were allowed to have a chain reaction and release all of that binding energy, what would happen? **BOOM!** Scientists needed a way to make the reaction manageable. Their answer was the **control rod.** The control rods are made of Thorium, and they act like an on/off switch by absorbing extra neutrons. We can control the rate of a nuclear reaction by using the control rods. Because of these and other safety features, nuclear power plants **cannot** explode like a bomb.

Scientists have tried for years to harness the power of nuclear fusion to use in a power plant, but they have only had limited success. Lots of energy needs to go into starting a fusion reaction, and once it starts there is no stopping it!

Nuclear Weapons

In the 1940's, scientists in the United States, led by Robert Oppenheimer, began working on ways to take this newly discovered nuclear energy, and turn it into a weapon. The came up with two different ways using Uranium and another element called Plutonium. These weapons were designed to start a chain reaction, without the presence of control rods. These were used on Japan at the end of World War II. It is the only time that nuclear weapons have been used on people.

In the 1950's more American scientists, led by Edward Teller, began work on the hydrogen bomb, humanity's most powerful and destructive weapon. This weapon used nuclear fusion instead of fission. The heat required to start the fusion reaction is so great that an atomic bomb is used to provide it. Hydrogen nuclei fuse to form helium and in the process release huge amounts of energy, thus producing a huge explosion. This process is much more explosive than a conventional nuclear bomb.

Advantages of Nuclear Energy

The Earth has limited supplies of coal and oil, which are used for most of our power needs. Some day they will run out. Nuclear power plants could still produce electricity after coal and oil become scarce because there is still much Uranium available in the world. It is a relatively common element that is found in abundance in the United States. Also , coal and oil burning plants pollute the air. They have been linked to problems such as Global Warming and Acid Rain. Well-operated nuclear power plants do not release contaminants into the environment.

Nuclear Energy is also much more efficient than traditional forms of chemical power. Only a small amount of uranium (about the size of a pencil eraser) can produce the same amount of electricity as many hundreds of pounds of coal.

Disadvantages of Nuclear Energy

The nations of the world now have more than enough nuclear bombs to kill every person on Earth. The two most powerful nations -- Russia and the United States -- have about 50,000 nuclear weapons between them. What if there were to be a nuclear war? What if terrorists got their hands on nuclear weapons? Or what if nuclear weapons were launched by accident? These are questions that must be considered by all people around the world. Nuclear explosions produce radiation. The nuclear radiation harms the cells of the body, which can make people sick or even kill them. Illness can strike people years after their exposure to nuclear radiation. The people in Japan have suffered for many years after the atomic bombs were detonated.

Nuclear reactions produce a certain amount of radioactive waste. This waste is difficult and expensive to dispose of, and can make people sick if it gets into the environment.

Even though nuclear power plants cannot explode like a bomb, one possible type of reactor disaster is known as a **meltdown**. In such an accident, the fission reaction goes out of control, leading to an explosion and the emission of great amounts of radiation.

Name:________________________________

In 1979, the cooling system failed at the Three Mile Island nuclear reactor near Harrisburg, Pennsylvania. Radiation leaked, forcing tens of thousands of people to flee. The problem was solved minutes before a total meltdown would have occurred. Fortunately, there were no deaths.

In 1986, a much worse disaster struck Russia's Chernobyl nuclear power plant. In this incident, a large amount of radiation escaped from the reactor. Hundreds of thousands of people were exposed to the radiation. Several dozen died within a few days. In the years to come, thousands more may die of cancers induced by the radiation.

Name:________________________________

Nuclear Chemistry Questions

1. What type of energy fuels the sun and stars?

2. What are the three types of nuclear energy?

3. What occurs in a nuclear fusion reaction?

4. Where does nuclear fusion occur?

5. What is radiation?

6. How can we use radiation as a good thing?

7. What occurs in a nuclear fission reaction?

8. How much of the worlds electricity comes from nuclear power?

9. What element is used to power nuclear power plants?

10. Can nuclear power plants explode like bombs?

11. What is the on/off switch of a nuclear reactor? What is it made out of?

12. Who was the lead scientist in developing the fission bomb?

Name:________________________________

13. Was the fission bomb every used? Where? When?

14. Who was the lead scientist on the fusion bomb?

15. Was the fusion bomb ever used? When? Where?

16. Why are scientists trying to make fusion reactors instead of fission reactors for electricity?

17. What are two advantages of Nuclear Power?

18. What are two disadvantages of Nuclear Power?

19. Do you think that Nuclear Power is a good thing? Why?

Name:________________________________

Half-life Simulation lab

Procedure:

1. Put the 80 M&M's in a box with the heads facing up.
2. Close the box. Shake the box vigorously.
3. Open the box and remove each M&M that is now tails up and replace it with a small wad of paper.
4. Count the number of M&M's that were removed. Record this value.
5. Repeat steps 2-4 for a total of 4 half lives.

Table 1:

Number of Half Lives	# of Decayed "Atoms"	# of Non-decayed "atoms"
0		
1		
2		
3		
4		

Prelab question: Define half life based on the following data table

Table 2: Information on half life of Carbon 14.

number of half lives	time elapsed (years)	Mass of Carbon-14 remaining undecayed. (g)
0	0	100
1	5430	50.0
2	10,860	25.0
3	16,290	12.5
4	21,720	6.25
5	27,150	3.13

Half-Life Simulation Experiment

Purpose:

Name:________________________________

Data/Observations:

Number of Half Lives	# of Decayed "Atoms"	# of Non-decayed "atoms"	Decayed "Atoms" Class total	Non-Decayed Class Total
0				
1				
2				
3				
4				

Class Data:

Half Lives	# of Decayed Atoms			# of Non-decayed Atoms			Decayed "atoms" Class Totals	Nondecayed "atoms" Class Totals
0								
1								
2								
3								
4								

Name:___________________________________

Analysis of Data / Observations:

1. What did the following represent?

heads up M&M	
Heads down M&M	

Grap

2. Prepare a graph using the pooled data by plotting the number of half-lives on the x-axis and the number of undecayed atoms remaining for each half-life on the y-axis. Your graph should have 2 lines, one for the class data, and one for your personal data.

3. Describe the appearance of your graph line. Is it straight or curv

   How would the appearance of your graph change, if more M&M's had been used? Explain.

4. How many undecayed nuclei would remain in a sample of 600 nuclei after 3 half-lives?

5. If 175 radioactive nuclei remain from a sample of 2800 nuclei, how many half-lives have passed?

6. How many half lives would it take for the remaining amount of radioactive material to be insignificant compared to the original sample? Explain your answer. Using your graph might help.

7. Will the original amount of radioactive material every become zero? ________________ Explain.

Name:________________________________

Name:________________________________

The Atomic Bomb Movie Questions

1. Who was General Leslie R. Graves?

2. Where was Uranium enriched for the first Atomic Bombs?

3. Why was the 'Fatman' bomb more efficient than 'Little Boy'?

4. How big was the 'Trinity' crater?

5. Where the 2 atomic bombs dropped on Japan?

6. Where was operation Crossroads held?

7. Where was 'Shot Baker' detonated?

8. How long did it take to create the buildings for 'Sandstone'?

9. What was the name of the corporation formed at Los Alamos?

10. How far is the Nevada Test Site from Las Vegas?

11. Why did the Japanese fishermen get sick?

12. How far was 'Operation Wigwam' from San Diego?

Name:________________________________

Name:__________________________________

Half Life Calculations HW

Radioisotope	Half-life
Hydrogen-3	12.3 years
Carbon-14	5,730 years
Polonium-212	0.0000003 seconds
Uranium-238	4.5 billion years
Phosphorus-32	14.3 days
Potassium-40	1,280,000,000 years
Radon-222	3.28 days

For each half life problem, calculate the number of decays that occurred in the problem. Then, show the decay process with the appropriate number of decays. Finally, show how many atoms are left or there were when the decay process began.

Example:
There are 1,000 atoms of Hydrogen-3 and they decay for 36.9 years.
How many atoms are left?

Work: Step 1 – *36.9 years/12.3 days per decay = 3 decays*

Step 2 – *1,000 atoms* $\xrightarrow{12.3\ years}$ *500 atoms* $\xrightarrow{12.3\ years}$ *250 atoms* $\xrightarrow{12.3\ years}$ *125 atoms*

Answer: *125 atoms*

1. There are 12,000 atoms of Radon-222 and they decay for 13.12 days.
How many atoms are left?

Work: Step 1 –

Step 2 –

Answer:

2. There are 100,000 atoms of Phosphorus-32 and they decay for 42.9 days.
How many atoms are left?

Work: Step 1 –

Step 2 –

Answer:

3. There are 800 atoms of Polonium-212 and they decay for 0.0000009 seconds.
How many atoms are left?

Name:_______________________________

Work: Step 1 -

Step 2 -

Answer:

4. How many billion years are required for a 12 gram sample of Uranium-238 to decay to a 3 gram sample?

Work: Step 1 -

Step 2 -

Answer:

5. There are 10,000 atoms of Radon-222 remaining after 6.56 days.
How many atoms were there to **begin with**?

Work: Step 1 -

Step 2 -

Answer:

6. There are 100 atoms of Carbon-14 remaining after 17,190 years.
How many atoms were there to **begin with**?

Work: Step 1 -

Step 2 -

Answer:

Name:________________________________

Nuclear Interview

Find someone over the age of 18 to interview about their knowledge of Nuclear Chemistry.

Who did you interview?

Here are the questions you should ask:

1. Can nuclear power plants explode like bombs?

2. Is all radiation bad?

3. Have nuclear weapons ever been used on humans? When?

4. Have their ever been other nuclear weapons exploded? When and where?

5. Have you heard of Chernobyl? If so, do you remember what happened there?

6. Do you think we should build more nuclear power plants? Why or why not?